IMPERIAL
DEPARTMENT OF AGRICULTURE
FOR THE WEST INDIES.

REPORT

ON THE

AGRICULTURAL DEPARTMENT

ST. VINCENT,

1916–17.

BARBADOS:

ISSUED BY THE IMPERIAL COMMISSIONER OF AGRICULTURE

FOR THE WEST INDIES.

1917.

[Price Sixpence.]

REPORTS

ON THE

BOTANIC STATION, ECONOMIC PLOTS, AND AGRICULTURAL EDUCATION, ST. VINCENT.

Annual Reports on Certain Economic Experiments conducted in connexion with the Botanic Station, 1900-2.

Annual Reports on the Botanic Station for the years 1901 and 1902.

Annual Reports on the Botanic Station, Economic Experiments, and Agricultural Education for the years 1902-3 to 1916-17.

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REPORT ON THE AGRICULTURAL DEPARTMENT, ST. VINCENT.

For the Year ended March 31, 1917.

[*The following Report comprises an account of the work performed by the Agricultural Superintendent and Staff of the Department during the year under review. The special investigations carried out by the Assistant Superintendent are credited to that officer in the text. The Government Veterinary Surgeon's statement is appended at the end as a supplementary report. The figures relating to the Government Ginnery and Granary have been supplied by the Manager.*]

Work in the Botanic Gardens, and Observations on Plants.

In view of the colony's revenues having suffered adversely owing to the war, and also to a succession of unfavourable seasons for Sea Island cotton, the work performed in the Botanic Gardens had to be largely directed to maintaining the grounds and plant collections in order at the lowest possible cost, consequently there was little new work undertaken or improvements made. On the whole, however, the usefulness and attractiveness of the Gardens were preserved. Apart from their use by residents, it should not be forgotten that a very large number of visitors from other places land from the mail steamers expressly for the purpose of visiting the Gardens, therefore it is pleasing to be able to report that it was found possible to maintain them in good condition, and keep up their reputation.

The drinking fountain underneath the temple was altered, in order that a continuous flow of water might be made available for visitors. It is now possible to drink directly from a bubbling jet, with the result that the use of drinking cups is avoided, and a modern and more sanitary method of water-supply instituted.

The water lilies, including the *Victoria regia*, which flowered in the circular pond below the temple, again proved of much interest. Two of the *Nymphaea lotus* varieties were discarded, namely *N. lotus*, var. *thermalis* and *N. lotus*, var. *devoniensis*, because of their habit of producing tubers on the flower stalk in the place of floral organs, perfect flowers being therefore rarely formed.

The 'millions' fish (*Girardinus poeciloides*) continue to thrive in the lily pond; besides keeping down mosquito larvae they also control aphides which occasionally attacked parts of the lilies just above the water-level. It is of interest to note that fish from the pond, which were introduced into swamps at Bequia and on Cave Grove estate, have become well established. Other lots put in swamps at Cumberland, Clare Valley, and Calliaqua have not been seen since they were introduced, but judging from experience elsewhere they will no doubt survive, and prove useful in controlling mosquitoes in these malarial districts.

Four large silk-cotton trees were pruned back, and four felled in the Gardens, in connexion with the campaign against the food-plants of the cotton stainer (*Dysdercus delauneyi.*) Each season those that fruited were heavily infested with the pest.

A short steep section of the new driving road to Government House was regraded. The grade was reduced considerably, and the road is now quite easy for wheeled traffic.

The beautiful crimson-bracted bougainvillaea (*Bougainvillaea glabra*, var. Mrs. Butt), originally received from Trinidad, has grown well and flowered freely. It was a most welcome addition to the collection, and has already found much favour locally. As it is readily propagated by means of cuttings it will soon be found in most private gardens.

The flowering of the largest-flowered leguminous plant *Camoensia maxima*, must be recorded. The plant is a woody climber. The flowers are fragrant, 1 foot long. The petals are white, fringed with yellow.

Herbarium specimens of the fine old tree which has been wrongly called here and in other islands *Piptadenia peregrina* were sent to the Royal Botanic Gardens, Kew; it has been identified as *Pithecolobium Berterianum*. This is a tall, large, smooth, grey-barked tree, with a distinct, almost perpendicular branching habit, and is quite a feature of the landscape from places near the Gardens.

The Mangosteen tree (*Garcinia Mangostana*) fruited freely, but another attempt to raise seedlings was not successful. Although the seeds were well covered with the luscious pulp, few appeared to be fully developed. It may be that as the age of the tree increases good seed will be produced.

The collection of decorative leaved codiaeums, or crotons, which consists of forty-five distinct varieties, was renovated by means of cuttings. The collection is grown on a long border in groups of six plants of each variety, reds and yellows alternating each other as far as possible.

The seedling mahogany tree (*Swietenia Mahagoni*) planted on March 4, 1913, by Her Highness Princess Marie Louise during her visit to the colony, has grown well, and has reached a height of 25 feet. The two Bermuda cedars (*Juniperus Bermudiana*) planted by His Honour Gideon Murray and the Hon'ble Mrs. Gideon Murray on August 28, 1912, to commemorate the opening of the new driving road through the Gardens, continue to thrive; they are now 27 feet high.

Two trees of Uganda cedar (*Juniperus procera*), planted out in 1917, although they have not grown very tall—17 feet only—yet have made strong, healthy, bushy growth.

An interesting palm which produced fruits for the first time here is the bamboo palm (*Rhaphia vinifera*). The flowering of the palm was recorded in the 1914-15 Report. Fibre from the palm is used for various domestic purposes in West Africa, and as 'Lagos bass' is exported for brush and broom making.

Among the selected varieties of grafted mangoes which fruited was one obtained a few years ago from St. Lucia, and known as 'Imperial'. The fruits were of large size, greenish yellow, and round. The pulp was free of fibre, juicy, sweet, of a pleasant flavour, intermediate between the 'Julie' and 'Peach' or 'Peters' varieties. The vegetative characters of the tree also suggest that this mango is a hybrid between the varieties named, but it is not equal in quality to either of them.

Although a fairly common edible fruit in certain other West Indian islands, the Sapote or Marmalade fruit tree (*Lucuma mammosa*) is not well known locally. The large hard seeds are occasionally imported, and used as a spice. A tree was discovered in a local provision ground, and plants were raised from this for the Gardens. The owner of the tree had almost destroyed it before he learned of its usefulness.

The handsome tree *Dillenia speciosa* flowered and fruited for the first time. The fruit, although acid, is edible.

In connexion with the campaign against the cotton stainer, considerable attention was devoted to the identification and distribution of indigenous and introduced species of the natural order Malvaceae, and the closely allied order Sterculiaceae.

The exceptionally heavy rainfall during the months of October and November caused much damage to the roads and drains. During October 15·97 inches of rain were measured, and in November no less than 32·52 inches. Fortunately, with the exception of a large flow of storm water through the nursery on the night of November 3, which carried away with it numerous plants in pots of various descriptions, little permanent damage was sustained.

Work in the Nurseries, and Distribution of Plants.

The demand for economic plants in pots, more particularly cacao, was small, and this is an indication of loss of interest in this particular product by small growers. At the Botanic Gardens a good supply of grafted plants of choice varieties of mangoes was prepared, but only eleven were sold during the year. Orders for a considerable number were, however, received for the next planting season. At the Experiment Station the demand for cuttings of good varieties of sugar-cane and for seeds of selected native yellow corn could not be fully met.

The following is a list of the plants, cuttings, seeds, etc., distributed from the nurseries at the Botanic Gardens and Experiment Station :—

ECONOMIC PLANTS.

Coco-nut	104
Cacao	40
Clove	24
Mango (grafted)	11
Hardwood trees	55
Guava	14
Total ...	248

CUTTINGS, ETC.

Sugar-cane varieties	18,274
Sweet potato	1,771
Gliricidia	800
Vanilla	75
Total ...	20,920

SEEDS, ETC.

Cotton seed (selected B.S.)	21 lb.
Indian corn (selected)	620 „
Onion seed (imported)	9 „
Papaw seed	¾ „
Total ...	650¾ lb.

FOLIAGE AND FLOWERING PLANTS.

Palms	79
Roses	131
Other decorative plants	84
Total ...	294

In addition, 259½ lb. of cured cacao was sold.

INSPECTION AND FUMIGATION OF IMPORTED PLANTS AND SEEDS.

Under the provisions of 'The Importation of Plant Diseases Prevention Ordinance, 1906', the following imports of plants and other vegetable produce for planting purposes were inspected for pests and diseases, and, when necessary, fumigated :—

Sugar-cane cuttings	15,200	
Coco-nut plants	501	
Orange plants (budded)	3	
Orchids	12	
Ornamental plants	20	
Onion seed	12	lb.
Vegetable seed	15	pkts.
Tobacco seed	3	parcels

SEED AND PLANT IMPORTATION.

Seeds of the Quebracho (*Quebrachia Lorentzii*) were received from the Imperial Commissioner of Agriculture, and two plants raised. The species is a large forest tree, native of the Argentine, where the very hard wood is used for railway sleepers, piles, bridges, beams, etc. From the wood reduced to chips a cutch-like extract is obtained. This is exported to the extent of nearly 100,000 tons a year to the United Kingdom, United States, etc., for tanning purposes. The tannin extract in a finely powdered condition is also imported into the United Kingdom from the Argentine Republic, and, according to a recent Consular report, the wood in logs finds a market in Russia.

Seeds of *Hyoscyamus muticus* were also received from the Imperial Department of Agriculture. These were sown, but unfortunately, after germination the young seedlings quickly damped off. Hyoscymine is obtained from this plant. In Montserrat, where the climate is drier, success in cultivating the plant has been obtained ; it is hoped to make another trial with it in the drier months of the year.

From the Assistant Director of Agriculture, Trinidad, seeds of *Khaya senegalensis* were received. The wood of this lofty tree is similar to that of mahogany, and the bark is used as a febrifuge.

Seeds of *Cupressus glabra* were received from the Bureau of Plant Industry, Office of Foreign Seed and Plant Introduction, Washington. A good number of plants of this useful Cypress were raised.

Seeds of *Aleurites Fordii* were received from the Imperial Department of Agriculture. Several plants were raised. The true Tung or China-wood oil of commerce is extracted from the seed of this plant.

From Trinidad, seeds of *Putranjiva Roxburghii* were received. Four plants were raised. The tree produces a white, close-grained, and very hard wood. In Calcutta it is highly valued as a shade tree.

A fruit of *Passiflora edulis* containing seed, was received from Trinidad. Several plants were raised. The edible pulp of this fruit is orange-coloured, with an acid taste resembling the flavour of an orange.

Afzelia cauanzensis has been grown from seeds supplied by the Forest Officer, Trinidad. The tree has a striking appearance, possessing a glossy, dark-green foliage. The seeds are ornamental, and are used as heads to ladies' hat pins.

Seedlings of good forms of single Hawaiian hibiscus were obtained from seed received from Trinidad.

The following plants of showy flowering trees and shrubs were presented by the Acting Director, Department of Agriculture, Trinidad, and planted out :—

Adhatoda sp.	*Cassia moschata*
Amherstia nobilis	*Bauhinia candida*
Dombeya Mastersii	*Kopsia* sp.

Other importations of seeds and plants,, some of which are reported on under the head Experiment Station, were :—

Bougainvillaea glabra, var. *Cypheri*, *Aloe Thraski*. and *Agave Franzosini* from the Botanic Gardens, Antigua ; *Mucuna* sp., *Indigofera longeracemosa*, *I. sumatrana*, *Tephrosia Vogelli*, *T. candida*, *Crotalaria Muyssii*, *C. incana*, *Clitoria cajanifolia*, thornless Dadab (*Erythrina lithosperma*), Alfalfa, white French Haricot beans, Madagascar beans, *Bentinckia nicobarica*, Gambia ground nuts, and Canavalia bean, from the Head Office of the Imperial Department of Agriculture; *Pritchardia Thurstoni*, from the Botanic Gardens, Trinidad ; *Juniperus oxycedrus*, from the Director, Royal Botanic Gardens, Kew.

Experiments at the Botanic and Experiment Stations.

THE EXPERIMENT STATION.

COTTON.

Cotton breeding constitutes one of the most important lines of work carried on at the Experiment Station. The principles of cotton selection now recognized in St. Vincent were set forth in detail in the Annual Report for 1915-16, and during the past year the work has been along the lines indicated therein. It is intended to publish the results of cotton investigations as they become available, but in most cases sufficient data have not yet been accumulated.

The question of manurial experiments with Sea Island cotton, and also of the low yields usually obtained in St. Vincent has been the subject of a detailed investigation by Mr. Harland ; the results are to be found in the *West Indian Bulletin*, Vol. XVI, No. 3, pp. 169-201.

It is there shown that the loss of crop suffered by St. Vincent planters year after year has been due chiefly to shedding of buds and bolls, caused by heavy rainfall, and intensified by fungus and bacterial disease. The plants themselves are not responsible for the low yield. Their innate capacity for bearing a large crop cannot be doubted ; it is the conditions that have been at fault, and it follows that the statements which have been made from time to time that the plants have 'deteriorated' are incorrect.

Both the internal and external boll disease are responsible for heavy loss, but the former is more to be feared. The cotton stainer has been shown to be the agent to which infection of bolls by the internal boll disease is due. If the recent legislation against the food-plants of the cotton stainer has the desired effect of relegating that pest and the internal boll disease to a position of minor importance, there is no reason why the loss hitherto suffered unavoidably from heavy rainfall should not be largely diminished by sowing the seed, say, at the end of August or even September.

Manurial Experiments with Sea Island Cotton.

The manurial experiments have now been carried on for five years The plots are each $\frac{1}{40}$-acre in area, and are permanently devoted to the experiments. Eight different combinations of manure are used, and the plots are in triplicate.

A detailed account of the manurial experiments is given by Mr. S. C. Harland in the paper previously alluded to, and a brief summary of the results obtained will now be given.

The investigations have proceeded along the following lines :—

(1) A study has been made of the data available from the manurial experiments during the past five years (1912-16 inclusive).

(2) The number of flowers opening daily in every plot of the Manurial Series, from September 8 to February 14, has been recorded.

(3) The number of bolls opening daily in every plot of the Manurial Series has been recorded for a period of fifty-three days. After that, pickings were made at intervals of five days.

The results of 1916-17 are presented in Table I below.

TABLE I.

RESULTS OF COTTON MANURIAL EXPERIMENT, 1916-17.

Manure.	Plot.	Number of flowers.	Number of bolls.	Per cent. bolls to flowers.	Average.	Yield of seed cotton per acre in lb.	Average.	Difference on No manure N.M. = 100.
	1a	6,300	1,003	15·9		220		Per cent.
No manure ...	1b	6,252	1,103	17·6	17·2	242	237	
	1c	6,229	1,129	18·1		248		
	2a	3,845	582	15·1		128		
Nitrogen ...	2b	9,239	1,369	14·8	15·4	301	258	+ 9
	2c	9,557	1,566	16·4		344		
	3a	4,568	525	11·5		115		
Phosphorus ...	3b	8,332	1,630	19·6	15·8	358	274	+ 16
	3c	9,817	1,588	16·2		349		
	4a	9,579	1,571	16·4		345		
Potassium ...	4b	9,659	1,707	17·7	17·0	375	404	+ 76
	4c	13,205	2,240	17·0		492		
Phosphorus	5a	7,877	1,395	17·2		307		
and	5b	9,623	1,677	17·4	16·5	369	344	+ 45
potassium ...	5c	10,954	1,619	14·8		356		
Nitrogen,								
phosphorus,	6a	9,221	1,436	15·6		316		
and	6b	11,905	2,459	20·7	17·6	540	431	+ 82
potassium ...	6c	11,971	1,993	16·6		438		
	7a	7,871	1,039	13·2		228		
Cotton-seed	7b	8,711	1,643	18·9	15·9	361	332	+ 40
meal	7c	11,809	1,851	15·7		407		
Phosphorus,								
potassium,	8a	11,471	2,207	19·2		485		
and cotton-	8b	9,940	1,900	19·1	19·5	418	511	+116
seed meal ...	8c	14,035	2 816	20·1		630		

The conclusions which have been arrived at are summarized as follows :—

(1) The percentage of flowers maturing into bolls does not vary greatly in the different plots, i.e. differences in the manurial treatment do not cause any notable differences in the percentage of flowers producing ripe bolls.

(2) All the manurial plots show an increased yield over the unmanured, the increase in the case of No. 8 amounting to as much as 116 per cent.

(3) The element most necessary is potassium, an application of potash alone producing an increase of 76 per cent. over the unmanured plots.

(4) For some unknown reason an application of phosphate and potash is less beneficial than potash alone. The difference in yield between plots 4 and 5 is apparently quite significant, but the experiments require to be conducted further before discussion can have much value.

(5) Artificials and cotton-seed meal are better than cotton-seed meal alone or artificials alone

(6) It appears that an application of cotton-seed meal at the rate of 600 lb. per acre is insufficient to meet the full requirements of the plants when grown on the same land for a number of years.

The results presented are a very strong argument for maintaining the fertility of the soil by means of as heavy applications of manure as possible, and by a rational system of crop rotation.

INDIAN CORN.

In the Annual Report for 1915-16 a general account was given of the methods of corn improvement in use at the Experiment Station. The experiments were continued during the past season. The work of selection of the St. Vincent native corn was carried as far as the seventh generation. The distribution of a large quantity of seed of the superior selected types has resulted in the raising of the standard of corn grown all over the island.

Unfavourable weather interfered very considerably with the hybridization experiments with this crop. The second generation of the cross Long's Yellow Dent by St. Vincent native was tasselling during the very heavy rains which fell in November. No self-fertilized seed was obtained, and only a few poor ears were available to carry the work forward. A large plot of the third generation was grown, and as the result of mass selection we now have in the fourth generation a set of very promising plants, the yield of which is much greater than that of the native types. It is hoped that a large quantity of seed will be available for distribution next planting season.

LIMA BEANS.

Selection work was continued with this crop, particularly with the variety Henderson's Bush Lima, which had proved to be the most promising of the American varieties tried. The conclusion has been arrived at that this variety is a pure strain, and that the good results of four generations of selection in 1915-16 were due to the fact that weather conditions during that season were particularly favourable. During the past season selection was carried forward to the sixth generation, and it was seen that no crop could be obtained if the rainfall was very heavy. In general it may be said that what is wanted in St. Vincent is a bush Lima bean which will yield well under a great variety of conditions. Certain of the indigenous pole varieties, if given supports on which to climb, stand varied weather conditions well, and the next step is to cross the

native pole varieties with the Henderson's Bush Lima. Our attempts to make hybrids, in spite of repeated trials, have so far been unsuccessful. The difficulty of manipulating the twisted keel, when emasculating the flower, is very great.

A variety sent from the Head Office, known as the Madagascar bean, was grown. The seeds were of large size, and of good quality for cooking, but the heavy rainfall of the past season was the cause of a very poor crop. This variety has been reported on so favourably from St. Lucia that further trials will be made with it during the coming season.

ARROWROOT.

Manurial Experiments.

Manurial experiments with arrowroot have been carried out in previous years, but the results have hitherto been inconclusive. It was therefore determined to plan an experiment in such a way as to yield definite results, and the principle adopted was to employ a large number of small plots, each $\frac{1}{120}$-acre in area.

The experiments were conducted with two objects: (1) to test the value of mulching with prunings of Madre del Cacao (*Gliricidia maculata*), (2) to compare the relative values of various combinations of organic and artificial manures. In the first experiment the number of plots was twelve, of which four were mulched, and eight were left unmulched. Each mulched plot received an application of 40 lb. Gliricidia prunings. The average yield of the unmanured plots was at the rate of 9,565 lb. per acre, while the average yield of the mulched plots was 15,663 lb. per acre. This shows a gain by mulching of 6,098 lb. per acre, or 63·8 per cent. This increase from mulching is very striking.

In the second experiment nine different combinations of manure were applied to thirty-six plots, each combination being in quadruplicate. The average yield of the manurial plots indicates that, with the exception of the plot which received nitrogen, every plot shows a gain over the unmanured plots. The plots to which Gliricidia prunings were applied show a gain of 34 per cent. over the unmanured plots. A complete manure consisting of sulphate of potash, basic slag, and cotton-seed meal produced the next largest increase, namely 19 per cent.

The results, as a whole, indicate clearly that the arrowroot grower will at any rate be well advised to apply to the soil as much coarse organic material as possible.

The complete results of this experiment appear in a paper by Mr. Harland in the *West Indian Bulletin*, Vol. XVI, No. 3.

MISCELLANEOUS CROPS.

A number of varieties of sweet potato and sugar-cane are kept at the Experiment Station for distribution.

Alfalfa.

Some seed of a strain of Grimm's alfalfa, said by the Director of Agriculture, in St. Croix to do well in that island, was received from the Head Office for trial. A good stand was obtained, but the plants grew to a height of only 9 inches. No seed was obtained from the plot, although flowers were produced in abundance. Our opinion is that this crop is not, on the whole, likely to prove adapted to West Indian conditions. There are many other plants native to the tropics which are much more vigorous in growth, and which are quite as useful for fodder as alfalfa.

Cowpeas.

Hybrids were made between the native black-eye and the rounceval pea, with the object of obtaining a strain of black-eye which would yield well under

a variety of conditions. Some promising strains were isolated in the F/3 generation, and it is hoped that some will be available for distribution next season.

Seeds of the following plants were received from the Head Office : *Mucuna* sp., *Idigofera longeracemosa, I. sumatrana, Tephrosia Vogellii, T. candida, Crotalaria Muyssii, C. incana, Clitoria cajanifolia*, Gambia ground nut, white French Haricot bean, *Canavalia gladiata*. Of these the first six species were for trial as green dressings. The Mucuna failed to germinate. The two species of Indigofera were very similar to the indigenous species, *I. Anil*, in manner of growth. The latter is often a troublesome weed in some districts, and these two introduced species cannot therefore be recommended as green dressings. The two species of Crotalaria grew to a height of about 3 feet, but were very susceptible to attack by the larvae of *Utetheisa ornatrix*. They also offer no advantage over the indigenous species *C. retusa*. *Clitoria cajanifolia* failed to germinate.

The Gambia ground nut proved to be an excellent variety, and further trials of it will be made on a larger area.

The white French Haricot bean proved to be a variety of *Phaseolus vulgaris*. It was rather susceptible to insect pests, and did not grow at all vigorously. Several of the indigenous varieties are much superior.

Canavalia gladiata was recommended as a new source of food. It suffered severely from attacks of the larvae of *Ballovia cistipennis*, and cannot at present be recommended as a food crop for St. Vincent.

Botanic Gardens.

At the Botanic Gardens a plot of the 1910 selected Sea Island cotton, known as B.S., which appeared to be a pure strain, was again grown for seed for distribution. The demand for seed of this cotton is considerable, and on two groups of estates a large acreage will be planted in it during the coming season. On small areas both in the Windward and Leeward districts the results obtained have satisfied growers that under adverse conditions this cotton opens better, and gives a larger yield than the ordinary type. Although the lint is shorter, and not as fine as 'good ordinary', yet the prices obtained for it on account, no doubt of its being very uniform in character, have always equalled, and in some cases exceeded, those obtained for ordinary marks.

At the Experiment Station efforts to improve the lint of this strain by hybridization are being made. In the plot at the Gardens a single plant showing greatly superior lint characters was discovered. From the care exercised in the saving of seed for planting, it was thought that the plant was a mutation from the type, and not the result of hybridization or admixture. It will be bred on by the usual methods, and its behaviour watched.

Special Entomological Investigations.

(BY THE ASSISTANT AGRICULTURAL SUPERINTENDENT.)

Owing to the exacting nature of the cotton breeding, and the manurial experiments, very little time was available for entomological investigations.

A pest of cowpeas appeared, not recognized hitherto in St. Vincent. This was the larva of a moth, *Ballovia cistipennis*, which has been recorded previously in Barbados by officers of the Imperial Department.

A few points about the life-history have been noted. The eggs which are almost flat, and pearly white in colour, are laid usually at the top of the flower-stalk or in the calyx of the young bud. Hatching takes place in from two to three days, and the young larva immediately bores into the tissues, where it remains until full-grown. The larval stage lasts about eight or nine days. When full-grown the larva enters the soil to pupate, and the moth emerges after about a week.

The damage inflicted by the boring larvae is considerable, as the parts most subject to attacks are the young flower-buds, the upper part of the flower-stalk, and the young pod. A variety of black-eye pea of American origin was so badly attacked that no crop was produced, although other varieties near-by were comparatively immune.

No larval or pupal parasites have been reared. *Trichogramma minutum* is known to parasitize the eggs. Other hosts for the pest are *Canavalia* spp., and a wild plant, *Vigna luteola*.

Some of the unidentified insects mentioned in last year's annual report have now been named. Many of them have proved to be new species.

DETERMINATIONS OF INSECTS REARED IN 1915-16.

Popular name of insect.	Scientific name.	Host plant.	By whom reared.
Lima bean worm.	*Nacoleia indicata*, Fabricius.	*Phaseolus* spp.	Mr. A. Busck.
Amaranthus worm.	*Pachyzancla bipunctalis*, Fabricius.	*Amaranthus* spp.	do.
Leaf-miner.	*Tischeria ?* sp.	*Synedrella nodiflora*.	do.
Lima bean blotch-miner.	*Agromyza inaequalis*, Mall.	Lima bean.	Mr. F. Knab.
Corn leaf blotch-miner.	*Agromyza parvicornis*, Lw.	Corn.	do.
Leaf-miner.	*Agromyza* n. sp.	*Commelina virginica*.	do.

DETERMINATIONS OF PARASITES REARED IN 1915-16.

Name of insect.	Name of host.	Kind of parasite.	By whom named.
Eucelatoria australis, Towns.	*Calpodes ethlius.*	larval	Dr. C. H. T. Townsend.
Sariodexia sternodontis, Towns.	do.	do.	do.
Chrysocharodes majoriam, n. sp.	Leaf-miner on Cassia *Commelina virginica.*	pupal	Mr. A. A. Girault.
Achrysocharella aetii, n. sp.	Leaf-miner on *Synedrella nodiflora.*	do.	do.
Polycystus clypeatus, n. sp.	*Agromyza parvicornis*, Lw.	do.	do.
Pseudomphale eudami, n. sp.	*Eudamus proteus.*	larval	do.
Grotiusomyia eudami, new genus and species.	*Eudamus proteus.*	do.	do.
Habrolepoidea submetalliea, Howard.	*Nezara viridula.*	egg	do.
Tetrastichus fasciatus, Ashmead.	*Cecidomyia manihot*, Felt.	larval	do.
Neocatolaccus syrphidis, Girault.	Pupa of syrphus fly which attacks corn aphis.	pupal	do.

Work Connected with Insect and Fungus Pests and their Control.

In last year's report some notes on the native food-plants and feeding habits of the cotton stainer (*Dysdercus delauneyi*, Leth.) were given by the Agricultural Superintendent.

Important developments have to be recorded as the result (a) of the investigations therein recorded, and (b) of further observations and experiments.

It is proposed to give here a short account of the investigations, and the action taken to control the pest, and safeguard the valuable Sea Island cotton industry. A full account of the work will be found in a paper written by the Agricultural Superintendent for publication in the *West Indian Bulletin*, Vol. XVI, No. 3, 1917. The matter was considered of such importance that a large amount of time and attention was devoted to it during the year under review.

INTRODUCTION.

The cotton stainer bug (*Dysdercus delauneyi*, Leth.) is the most serious insect pest of cultivated cotton in St. Vincent, not on account of the injury done by it in

feeding on seed and directly staining lint, but because of its association with certain destructive internal boll diseases. When it can be stated that these diseases following attacks of the bug occur in all districts, and have caused losses of seed-cotton, in some cases as high as 96 per cent., over a large area of well cultivated and productive cotton, it will be readily seen that the local cotton industry is seriously menaced. Experiments have proved that in St. Vincent, under certain circumstances, an attack of the cotton stainer on an unopened cotton boll leads to an internal diseased condition. The life-history of the pest had not been worked out, and there remained many questions concerning the life-history, feeding habits, and food-plants, on which it was desirable to obtain additional information.

Distribution.

The species occurs abundantly throughout the coastal district of the Colony. No other species of Dysdercus occurs in the island. A variety in which the hemi-elytra are red instead of black has been noted in St. Vincent and the Grenadines, but this form is comparatively rare.

Life-History.

In order to study the life-history, hurricane lamp-chimneys were used. The chimneys were inverted and stood in lids of butter tins, and in the bottom of each chimney was placed river sand to a depth of 2 inches. The top was covered with gauze which was held in position by a rubber band. The food material for adult insects was placed on stalks or sticks 3 to 4 inches above the level of the sand, and that for nymphs on the sand. Water was given when necessary, either from above or below. The breeding cages thus formed were placed in a large bow-window with an eastern aspect, so that the insect had plenty of air and sunshine. By means of a watch-maker's lens the behaviour of the insects in the cages could be closely followed.

Records were made daily between 7 a.m. to 10 p.m.

Eggs.

The eggs are smooth, ovoid, creamy white with a pearly lustre. They are slightly sticky when first laid, but freely separate from each other on drying. They measure about 1·2 mm. in length and 0·78 to 0·84 mm. in width.

The changes visible to the unaided eye noted during incubation are as follows: First three days, contents clear. Fourth day, lumpy and less opaque in part. Fifth day, tinged with yellow, more particularly at the poles. Sixth day, darker yellow, and colour more diffused. Seventh day, deep orange.

Experiments to Ascertain where Eggs are Laid.

Many experiments were made in the lamp-chimneys in order to ascertain where females lay their eggs. These comprised tests with (a) seed-cotton, (b) old cracked cotton bolls, (c) freshly opened bolls, (d) unopened cotton bolls, but no eggs were laid anywhere but in the sand at the bottom of the chimneys. The results gave a clue to the place and manner of ovipositing in the field. It was found, as in the case of eggs laid in the chimneys, that eggs are deposited in masses in the ground, and carefully covered over.

Laid in moist sandy soil the eggs take from seven and a half to nine days to hatch.

Frequent search for eggs on all parts of the cotton plant, silk-cotton (*Eriodendron anfractuosum*), and 'John Bull' (*Thespesia populnea*) trees aboveground over a considerable period has been without result.

In cases where adult females were confined, and could not readily obtain access to the soil, eggs have been found in and under seed-cotton in a storehouse, and in a room in a dwelling house into which the insects had wandered from 'John Bull' trees near by.

The eggs appear to be nearly always fertile, and in only one case in the large number of masses observed was there any appreciable number of infertile eggs.

It was desirable to obtain information as to whether ants exercised any control over the cotton stainer by destroying exposed eggs. In tests made with a number of common species of field ants the following observations were made.

The small red stinging ant (undetermined) frequently attempted to carry off the eggs but did not succeed. The crazy ant or 'wild Irishman' (*Prenolepsis longicornis*) was strongly repelled by the eggs, both newly laid and six days old. The eggs were placed on the ground in places where the ant was running about in search of food. On meeting an egg in its track it would suddenly stop, and then run away from it, often backing and twisting round as if repulsed by some noxious odour. The common small black stinging ant (*Solenopsis geminata*) readily carried off the eggs, as also did the hunting 'tac tac' (*Odontomachus haematodes*).

No egg-parasite has been observed. It is possible that one will be found, as in the case of the eggs of allied hemiptera, but the successful manner in which the eggs are hidden makes this appear doubtful.

Life-Cycle.

In the laboratory the life-cycle—that is from egg to egg—occupied from forty-five and a half to forty-nine days. There are five moults which take place at intervals, approximately as under:—

1st	moult	3 days (after hatching)
2nd	,,	4-5 days later
3rd	,,	5 days ,,
4th	,,	7 days ,,
5th	,,	8-10 days—when insects reach maturity.

The insects pair in three or four days after becoming adult, if suitable food is available, and eggs are laid from six to eight days later.

Before a moult the gregarious habit is strongly marked and especially so for the later moults. The insects collect together for one to two days prior to shedding their skins. No feeding takes place before and during a moult, but it is resumed soon after.

Collections of cotton stainers not feeding, but preparing to feed, and undergoing the last moult, form striking objects on bushes bordering or close to cotton fields near the end of the crop when the cotton stalks are almost bare. Plants which provide shelter from the sun and rain are preferred, and it is no uncommon sight to see thousands of stainers grouped together on a single bush. It is this habit that has given rise in part to erroneous ideas concerning the feeding habits of the insect. The writer has investigated, among others, collections on wild guava (*Psidium Guava*), cacao, banana, plantain, *Cycas circinalis*, a hedge of *Euphorbia Canariensis ?*, and a shelter belt of galba (*Calophyllum Calaba*).

Dark greenish-yellow excrement is not voided until maturity is reached. In other stages the excrement is colourless or slightly tinged only. This is a point of considerable interest, because it shows that nymphs cannot cause damage to ripe seed-cotton by staining it, even if they are present in large numbers. It might be stated that the staining of cotton due to adult excrement is almost negligible both in the field and in the breeding cage.

Experiments were made in the endeavour to ascertain whether young nymphs were able to feed through unopened cotton bolls, and although inconclusive, they appeared to point to the fact that those not exceeding the fourth instar in age were unable to do so, and bore out observations made in the field with cotton bolls, silk-cotton, and 'John Bull' fruits.

Experiments with Adults.

In the experiments with adults well fed on seed-cotton, it was found that egg laying commenced from five to seven days after pairing, from nine to eleven

days after reaching maturity. After the first batch of eggs is laid, further lots are deposited at intervals of three to four days for the earlier, and six to seven days for the later ones. The highest number of eggs laid at one time was 106. In two cases seven batches of eggs were laid over a period of one month. In the first the total number of eggs was estimated at 296 to 336, and in the second the actual count was 482.

The manner of egg-laying was witnessed a large number of times, and is as follows: The female on detaching herself from the male, starts to hunt about on the ground, until she eventually settles on a suitable place; this was usually a level surface, and no particular preference appeared to be given to depressions, pits, or cracks. At the place selected she starts to dig with her front feet, till she eventually excavates a small hole about ¼-inch deep. As soon as the nest is finished she reverses, places herself in the hole, and sits almost upright in it. After the eggs are laid she gets out, and immediately proceeds to fill in the hole with particles of sand, until a small but inconspicuous mound is formed over the egg-mass. The eggs are laid in a compact mass, and covered by about ¼-inch of soil; sometimes a full hour is spent in the covering operation alone. Egg-laying indoors has always taken place in the afternoon, evening, or night. In the field it no doubt takes place chiefly at night when the insect is less likely to be disturbed.

It will be realized from the description of the careful way the eggs are hidden, that, unless the actual act is witnessed, the eggs would be difficult to find in the field, and this has proved to be the case. Only by carefully digging over the ground under cotton plants have they been found. In the case of fairly large trees, like the 'John Bull' and silk-cotton, it is not so difficult, and on searching the ground under infested trees, especially near the bases of the trunks, a large number of egg-masses have been discovered.

The question of destroying the eggs in the field naturally arises. Frequent tillage might be thought to offer a means of dealing with them, as in the operation the eggs would be buried so that the nymphs could not emerge from the soil, or they would be exposed to predaceous insects. Weighing the case, however, from a practical stand-point, the method appears to offer little hope of success, as the cultivation of cotton has to be suspended at a relatively early period to obviate root injury.

The longest time a female insect was kept alive in the breeding cage on seed-cotton was sixty-eight days, and a male sixty-three days. These insects on reaching maturity were breeding continuously until a short time before death took place. It is possible that when not breeding owing to lack of suitable food, they may be able to survive for some time longer than the periods given above

Food-Plants.

Up to the present the cotton stainer has not been found to breed on any other species of plant except those belonging to the natural order Malvaceae, and the closely allied natural order Sterculiaceae. In the latter, however, the only representative found to be a food-plant is *Sterculia caribaea*, the 'Mahoe cochon' or 'Stave-wood' tree.

The malvaceous plants other than cotton occurring commonly in St. Vincent, on which the insect feeds and breeds freely, are the silk-cotton (*Eriodendron anfractuosum*) and 'John Bull' or mahoe (*Thespesia populnea*). The ochro (*Hibiscus esculentus*) is also attacked, but as the unripe fruit is the part gathered and used as a vegetable, the insect cannot make much progress on it. A few insects are occasionally found on the open fruits of the Down or Cork-wood tree (*Ochroma lagopus*, Sw.). The seeds being small they provide little food, and besides, they are greedily sought after by mice. The pods, moreover, are carefully collected by people in the month of April to obtain floss for stuffing cushions and pillows. In the Grenadines perennial cottons, the silk-cotton tree, and the wild ochro (*Malachra capitata*) provide suitable food for the pest throughout the year.

At the extreme northern end of St Vincent, in the mountains at the back of Sandy Bay and Owia, the 'Dobarabois' (='Douve bois') or Stave-wood tree (*Sterculia caribaea*) is found. On this tree the cotton stainer feeds and breeds in the period from February to April

In St. Vincent, for a few days when food is scarce, as is the case in certain districts after the old cotton stalks are burnt and the abovenamed trees are not fruiting or near at hand, the stainer, in order to sustain life, or complete maturity previous to flight in search of food, is sometimes found feeding, but not breeding, on other plants; these were described in last year's report.

Flights.

In connexion with the silk-cotton, 'John Bull,' and 'Stave-wood' trees, flights of the cotton stainer from cotton fields to these trees have been observed, and from cotton field to cotton field. That periodical flights on a considerable scale from one food-plant to another do take place there is no doubt.

Control or Remedial Measures.

In view of the desirability of eradicating certain of the native food-plants, a special Ordinance was passed to enable this to be done. The work of destruction was carried out by the Agricultural Department at Government expense. Operations were started in August 1916, and by the end of April 1917 the work was practically completed. During the period 1,542 silk-cotton trees, 11,570 'John Bull' trees, and several thousand seedlings were destroyed, at a total cost of £295.

Besides the destruction of native food-plants such as described, it is suggested that the control of the pest will be facilitated if growers devote attention to the following:—

(a) The inauguration of a close season from February to May, or longer.
(b) The trapping of the pest by means of cotton seed, seed-cotton, or cotton-seed meal just before the cotton starts to flower.
(c) The collection of cotton stainers in the field.
(d) During the close season search should be made in cotton fields for any growing cotton stalks that may have been overlooked, and when found they should be pulled up and burnt.
(e) Any cotton stainers found in the vicinity of cotton houses should be collected and destroyed, and all seed-cotton or cotton seed refuse on which the insects may be feeding should be burnt.
(f) Any cotton-seed meal used on estates as manure should be carefully covered over with soil as quickly as possible after it is applied, and any cotton stainers that may be attracted to it, in store or otherwise, killed.

In regard to (a) it is thought that if a close season for Sea Island cotton from February to May is instituted, cotton planted in the latter month would not flower before July, and there would be little food for the pest from February to July.

Natural Enemies.

These are few and relatively unimportant, so far as can be ascertained at present.

NATIVE FOODS.

Owing to the high prices of imported foodstuffs due to the war, and a world-wide shortage of cereals, much attention was devoted to the production and conservation of local food products for human consumption. In certain respects the colony was quite able to meet locally the requirements of the population, and it was chiefly in respect of wheat flour for bread making, and for which there was no satisfactory substitute, that some concern was felt, owing to the possible restriction of imports of that commodity.

In connexion with the general food situation the Agricultural Superintendent held meetings in different parts of the colony, and gave advice to growers as to the planting and storage of particular products for times of scarcity. The six months of the year when local food supplies were difficult to obtain were March to August. Particular attention was devoted under this head to corn, peas and

beans, cassava, yams, eddoes, all of which could be produced in quantity. It was unnecessary to advocate the planting of other ground provisions and fruits used as food which would not keep for any length of time, because they were always plentiful in season, and were exported in large quantities to intercolonial markets. The planting of food crops which had to be marketed shortly after being reaped had often led to much disappointment and monetary loss.

The following brief notes relating to certain local foods may be of interest. The work with corn is reported on separately on page 23.

SUGAR, SYRUP AND MOLASSES. Local supplies of muscovado kinds were sufficient. Planting of sugar cane is being extended. Exports are rising annually.

HONEY. A limited supply obtainable in season.

MEAT AND POULTRY. Supplies good, and prices moderate. Exports of large and small stock in 1916, 4,821 head, valued at £8,332.

FISH. Plentiful in season, and cheap.

CACAO (CURED). Sufficient for local requirements. Made into chocolate it is largely used as a beverage.

LARD OIL FROM COTTON SEED. Crude cotton-seed oil is obtainable at the Government Ginnery, and a certain quantity is refined locally. The full requirements of the colony could be easily met, if necessary.

WHALE OIL. Plentiful and cheap in the whaling season.

COCO-NUT OIL AND BUTTER. The requirements of the colony are already partially, and could be fully met, by the use of the oil expeller at the Government Ginnery. Coco-nut butter as a substitute for imported butter has been made and found palatable.

CORN. The cultivation has been extended considerably. Large quantities of corn were kiln-dried and stored at the Government Ginnery, and then converted into meal. Supplies of corn and meal would be ample at all times, and at reasonable cost, if proper storage arrangements were made. As an adjunct to wheat flour the meal can be largely used in bread making. Excellent bread, consisting of 25 per cent. native kiln-dried corn meal added to 75 per cent. wheat flour, has been made.

CASSAVA. Cassava is largely grown for starch and farine. As farine it is much used as a substitute for flour: 1,321 bushels of farine were exported in 1916, and 182,004 lb. of starch. Samples of the roots, peeled, dried, and ground have been found to yield a useful flour.

BREADFRUIT. Abundant and cheap in season. When the supply exceeds the demand the fruits can be peeled and dried, converted into flour, and stored.

PEAS AND BEANS. Pigeon and black-eye peas are extensively grown. They are readily stored and form a most valuable food for the people. The exports in 1916 amounted to 6,118 bushels. In smaller, but not in considerable quantities, Lima, bonavis, and Portuguese or six weeks beans are produced and used.

SWEET POTATOES. Abundant and cheap in season, but they do not store well. They are not plentiful in the months from April to August. Sliced and dried, they can be stored, and ground to meal when required for use.

YAMS. Generally grown, and cheap in season. Certain varieties can be stored for several months, and used when other ground provisions are scarce. Increased attention is being directed to them.

TANNIAS. Widely cultivated for food, and also exported in considerable quantities to intercolonial markets.

EDDOES. Like yams, certain varieties store well, and in this way are very valuable in times of scarcity. Plantings are being increased.

Unlikeeddoes, the local varieties of tannias do not store well.

BANANAS AND PLANTAINS. These are generally grown, and used as a vegetable. Supplies are sufficient and cheap at different periods of the year, but there was usually no surplus to dry and convert into meal.

ARROWROOT. This is a staple product. The lower grades of arrowroot starch are extensively used as food, but their food value is low.

GROUND NUTS. This nut is extensively cultivated. It provides a rich, sustaining food. The valuable oil is not extracted from the kernels locally, but it might be, if necessary, at the Government Ginnery. It will be seen in the export returns that the exports of nuts for 1916 amounted to the large total of 14,641 bushels, valued at £3.660.

COTTON-SEED MEAL. Although not yet used, still it might be, in case of emergency, as an adjunct to wheat flour in bread making. In the cotton districts of the United States a bread made with 15 per cent. of cotton-seed meal added to wheat flour is said to be quite good. The Government Ginnery could supply all the meal required for this purpose, if found necessary.

It will be seen that St. Vincent is producing, and could produce, many valuable foods in quantity and in such variety that the demands of the human body in respect of proteins, fats, and carbohydrates could be met, but the proper preparation and storage of certain of them is of primary importance, in order that periods of scarcity might be tided over.

To give a striking instance may not be out of place here. In the Southern Grenadines the islanders produce excellent crops of corn and peas, which would be quite sufficient, if properly stored, to provide food throughout the year, but every season 75 per cent. of the stored crops is lost from the attacks of grain insects. The result is that at times the people suffer much hardship, and have to purchase expensive, and often less nutritious food, from outside sources.

Progress in the Chief Industries.

COTTON.

The adverse effects on the Sea Island cotton industry of several unfavourable seasons in succession, coupled with severe attacks of the cotton stainer (*Dysdercus delauneyi*, Leth.) and internal boll diseases, led to a serious set-back in planting. Only 2,401 acres were planted for the 1916-17 crop as against 2,622 acres in 1915-16, and an average annual acreage for the five seasons, 1910-11 to 1914-15 of 4,200 acres. In fact the 1916-17 plantings were the lowest since 1906-7. Another disastrous season was experienced, and the output of lint of all descriptions from the 2,401 acres is estimated at 160,168 lb. only, or at the rate of 66 lb. per acre. The chief damage to the crop was caused by abnormally heavy rains in October and November. At this time a high percentage of the flower-buds and bolls formed were shed, and of those that remained many were affected by external and internal boll diseases. The bolls that were subsequently formed gave a poor return, owing to internal diseases following attacks of the cotton stainer.

The weather cannot be controlled, but it is absolutely necessary to control the cotton stainer, if the stability of the valuable cotton industry is to be ensured. The energetic measures which were undertaken in the endeavour to keep down the pest, at least until a fair proportion of the first pickings was secured, are reported on in previous pages.

The prices obtained for the cotton already shipped were good, but these, even if maintained for the remainder of the crop, will not cover the losses sustained by growers. Notwithstanding the unfortunate situation, it is the intention

of many planters to give the industry a further trial, and it is hoped that a good season, quick sales, and high prices will reward their efforts.

The following table shows the acreage planted in Sea Island cotton in each of the past twelve seasons, the total yield of lint, and yield per acre :—

Crop.	Area planted, in acres.	Weight of lint, in lb.	Yield of lint per acre, in lb.
1905-6	790	137,460	174
1906-7	1,533	268,275	175
1907-8	3,200	432,000	135
1908-9	3,000	372,000	124
1909-10	2,528	356,139	141
1910-11	3,587	561,526	156
1911-12	5,068	487,116	96
1912-13	4,344	428,032	98
1913-14	3,768	399,187	106
1914-15	4,226	323,326	76
1915-16	2,622	205,111	78
1916-17	2,404	160,168*	67*

* Estimate.

Average yield of lint per acre for twelve years, 118·7 lb.

The foregoing table gives the amount of crop as actually reaped. As, however, for statistical purposes it has been a matter of custom to have a record of the quantity of cotton exported, the following table gives the amount exported from the colony in the period indicated :—

Exports of Sea Island cotton for each crop year, October 1 to September 30, from 1905-6 to 1916-17.

Year.	Export of lint, in lb.
1905-6	121,174
1906-7	225,055
1907-8	388,833
1908-9	432,091
1909-10	372,057
1910-11	515,237
1911-12	487,116
1912-13	443,878
1913-14	373,122
1914-15	291,260
1915-16	237,387
1916-17	99,588

Marie Galante Cotton.

The area returned as cultivated in Marie Galante cotton in the Southern Grenadines for the 1916-17 crop was 1,050 acres. The area of the previous season's planting was 1,069 acres. The acreage, as mentioned in previous reports was not exclusively planted in cotton, but with it were grown corn, peas, and ground provisions. The output in 1915-16 was 32,215 lb. and in 1916-17, 45,852 lb.

Throughout these islands Sea Island cotton was grown as well as Marie Galante, and the acreage planted in the former shows a progressive annual increase. The Sea Island seed for planting is obtained each season from St. Vincent.

The prices for Marie Galante cannot be given, as owing to lack of shipping facilities no cotton has reached the market, but they should be high.

Production of Seed for General Planting.

A large supply of Sea Island cotton seed of the good ordinary type for general planting was again reserved at the Government Ginnery under the supervision of the Agricultural Superintendent. This seed was from a selected stock kept by the Agricultural Department. Part of the full quantity of seed was grown at Rothes Mill estate, and part on the Island of Bequia.

For the 1916-17 crop 11,423 lb. of selected and certified seed was sold at 5c. per lb. At 5 lb. to the acre, the germination of the seed being good, this quantity was sufficient to plant 2,284 acres. In selecting the seed, 7·4 per cent. was reserved, and 22·8 per cent. rejected as not reaching the desired standard.

Government Ginnery.

It may be of interest to give certain results of the working of the Government Ginnery for the 1916-17 crop, other than those relating to corn and cotton seed for planting.

Sea Island Cotton.

Grade.	No. of lb. of seed-cotton ginned.	Ginning outturn of lint, in lb.	Percentage of lint to seed-cotton.	Ginning loss, per cent.
'Superfine' white	77,327	19,228	24·8	1·8
'Ordinary' white ..	187,431*	48,710	25·9	1·9
'Stains' ..	85,322*	19,715	23·0	1·5

The proportion of stained lint to white lint of all grades is 29 per cent., which clearly shows the effects of the adverse season.

Marie Galante Cotton.

Grade.	No. of lb. of seed-cotton ginned.	Ginning outturn of lint, in lb.	Percentage of lint to seed-cotton.	Ginning loss, per cent.
White ..	161,992*	40,549	25	0·7
Stained	7,855*	1,841	24·6	3·1

Co-operative Dealings in Cotton.

The following is a brief account of the ginnery's transactions under this head. Seed-cotton was taken over on a profit-sharing basis. After deducting the payment made on account and all charges, three-fourths of the net profit made by the sale of lint and seed is returned to the grower. The prices paid on account for Sea Island seed-cotton were :—

1st grade white	10c.	per	lb.
2nd „ „	8	„	„
1st „ stains	3	„	„
2nd „ „	2	„	„

The financial results owing to shipping delays, are not to hand, but the working results were as under :—

*Seed-cotton from plantations on a profit-sharing basis, not included in these totals.

Grade.	Seed-cotton taken over, in lb.	Ginning outturn of lint, in lb.	Percentage of lint to seed-cotton.	Ginning loss, per cent.
1st White	103,689	27,001	26·1	1·9
'Stains'	28,550	6,993	24·2	2·1

The proportion of 'stained' to white lint was no less than 25·7 per cent.

Marie Galante Cotton.

The following are the quantities of Marie Galante cotton dealt with on the same basis as Sea Island.

The prices paid on account for seed-cotton were :—

1st grade 4 c. per lb
2nd „ 3 c. „ „

Grade.	Seed-cotton taken over, in lb.	Ginning outturn of lint, in lb.	Percentage of lint to seed-cotton.	Ginning loss, per cent.
No. 1	157,229	39,464	25	0·7
No. 2	7,455	1,841	24·6	3·1

The proportion of second to first grade lint was 4·6 per cent. only.

The total quantity of Sea Island and Marie Galante seed of good quality obtained was 191,359 lb., and 5,376 lb. of poor grade from the 'stains'.

The whole of the 191,359 lb. of seed was put through the oil expeller. For every pound of white seed-cotton sent to the ginnery the grower was entitled to receive on application, and free of charge, ½-lb. of cotton-seed meal for stock feed and manurial purposes. The cotton-seed meal actually returned to growers amounted to 144,751 lb. The balance of meal that remained after the transactions were closed was 7,991 lb. This reverted to the ginnery.

Oil Expressing Department.

In the oil expressing department 272,922 lb., or 121·8 tons, of prime cotton seed were put through the Anderson oil expeller. The seed was purchased at the rate of $10 per ton, and there were returned, free of cost, to the sellers 1,700 lb. of meal for every ton of seed sold.

Besides this, 86,391 lb., or 38·5 tons, of inferior seed was disintegrated for growers who used seed thus treated as manure.

Practically all the cotton-seed meal and disintegrated seed obtained was used in the colony, either as food for stock or as manure for different crops.

STARCH INDUSTRY.

The prices of arrowroot and cassava starches were maintained at a remunerative figure. The output of arrowroot was adversely affected by the heavy rains of November. With a large area in cultivation the reaping of arrowroot has to be started on certain estates in October, in order that the crop may be taken off before the spring, with the labour supply available. On others it is necessary to make an early start so as to obtain sufficient water for power and manufacturing purposes.

Unless the rhizomes are thoroughly mature, poor yields are obtained. Heavy and continuous rains, such as were experienced in November, delayed the maturation of the rhizomes, and caused those that were mature to start new growth.

The following table shows the exports and value of arrowroot and cassava starch during the past nine years:—

Year.	Arrowroot, in lb.	Value, £.	Cassava, in lb.	Value, £.
1908	4,886,379	27,713	236,502	1,352
1909	5,594,098	31,792	195,166	1,009
1910	5,302,725	30,089	138,112	781
1911	4,254,130	40,430	121,562	1,269
1912	3,948,641	40,854	177,820	1,287
1913	4,327,036	53,607	227,206	1,570
1914	4,618,347	57,806	160,564	1,088
1915	5,290,781	44,689	111,722	504
1916	4,441,242	37,619	182,004	860

The table shows that the exports of arrowroot in 1916 were 849,539lb. less than in 1915, while the exports of cassava starch were 70,282 more.

CACAO INDUSTRY.

There is little to record. The crop continues to lose ground, and the acreage devoted to it shows a diminution.

The exports of cured cacao for the past nine years are given below:—

Year.	Weight in lb.
1908	218,664
1909	241,294
1910	235,236
1911	285,869
1912	223,373
1913	213,684
1914	225,146
1915	236,843
1916	178,744

SUGAR INDUSTRY.

The revival of sugar cultivation was commented on in last year's report. It was stated that owing to increased plantings the output of sugar for 1916 was likely to be double that of 1915. The exports show that more than twice the quantity was actually exported, and this after meeting fully the local demand.

Exports of Muscovado Sugar, Syrup, and Molasses.

Year.	Sugar, lb.	Value, £.	Syrup and molasses, gallons.	Value, £.	Total value, £.
1913	250	2	3,252	171	173
1914	281,990	1,586	8,904	252	1,838
1915	505,232	3,253	10,079	503	3,756
1916	1,198,314	9,520	33,771	1,475	10,995

Sugar and sugar products now take the third place in the list of exports in point of value.

Cultivation was limited by the capacity of the small mills, which are not numerous. Some improvements in manufacturing machinery were made, the most extensive being at Orange Hill, in the Carib Country.

The demand for good varieties of cane plants was considerable, and as many as possible have been distributed from the plots at the Experiment Station.

On several estates there were rather severe attacks of the moth borer (*Diatraea saccharalis*, Fabr.).

Progress in Minor Industries.

INDIAN CORN (MAIZE).

Considerable progress has been made with corn cultivation. There was a great incentive to the production of this cereal owing to :—

(a) the high prices of imported cereals and flour,
(b) the remunerative prices obtained for corn, both locally and intercolonially,
(c) the desirability of a locally produced supply of corn meal for use in the event of a restriction of supplies of imported breadstuffs.
(d) the facilities offered by the Government Granary for the purchase of corn on a profit-sharing basis, and the kiln-drying and storage of it for use when most wanted.

It is difficult to obtain figures of the actual quantity of corn produced, but it was undoubtedly large. The local consumption was higher than usual, owing to the facts mentioned above in (a) and (b).

The following are the export figures of the past four years :—

1913	...	...	...	745	bushels
1914	...	...	...	766	,,
1915	...	...	...	1,518	,,
1916	...	...	...	1,652	,,

A bushel of corn is taken to weigh 56 lb.

The Government Granary was worked under the supervision of the Agricultural Superintendent.

The corn-drying and shelling machinery installed there was described in last year's report. During the year a power 'No. 1, Kelly Duplex' grinding mill was added. This has a daily capacity of 8 to 9 cwt. of corn meal which would pass through a sifter of 30 mesh. In addition, a modern circular iron corn bin, of 200 bushel capacity, and other bins were erected. The total of the bin space is sufficient to store 700 cwt. of dried corn. Each bin is so arranged that its contents may be readily fumigated with carbon bisulphide.

In the case of a large circular bin in which kiln-dried grain was stored in bulk, a perforated wooden tube was made to extend from the top to the bottom of it and through the cover. The cover was sealed down. Inspection of the corn for insects was made through a closely fitting man-hole in it. If grain insects were present the man-hole was sealed, and the heavy and volatile insecticide in the necessary quantity was poured on a piece of cotton lint placed just inside the top of the perforated tube. The slightly projecting end of the tube was then closed tightly. This method proved most convenient and effective. It was not necessary to remove the lids of the bins when corn was required, as by a simple and tight shoot arrangement the grain was delivered at the base of the bins directly into bags.

The condition of the grain purchased, dried, and stored in 1916, when disposed of in the period March-June 1917, was excellent throughout.

Seeing that much attention is being directed to corn, both in this and in other colonies, it may be of interest to give here the results of working the granary for the 1916-17 crop, although part of the work extended later into 1917 than the period covered by this report.

GOVERNMENT GRANARY.

Results of Working for 1916-17 Crop.

	Estimate of quantity of undried or 'wet' corn.		
Cob corn dealt with on profit-sharing basis ...	53,647 lb.	- 25 per cent. =	40,235 lb.
Grain corn dealt with on profit-sharing basis ...	38,753 „		38,753 „
„ „ shelled for outside growers	18,386 „		18,386 „
„ „ undried, ground to meal for outside growers	24,053 „	+ 10 per cent. =	26,458 „
„ „ kiln-dried and converted to meal ...	2,547 „	+ 14 per cent. =	2,903 „
„ „ kiln-dried	1,741 „	+ 7 per cent. =	1,863 „
Total	...	... ...	128,598 „

The total estimated quantity of corn dealt with in terms of undried or 'wet' grain was 128,598 lb., which equals 2,296 bushels, or 1,148 bags.

Summary of the Results of the Co-operative Dealings in Corn for 1916-17 Crop.

STATISTICAL.

Total weight of cob corn taken over	53,647 lb.
„ „ „ shelled corn do.	38,753 „
„ „ „ kiln-dried corn obtained	71,804 „
„ „ „ „ „ meal sold	63,941 „
„ „ „ „ „ corn on hand	1,249 „
Number of persons who supplied corn	150
Average moisture content of wet grain corn	15·5 per cent.
„ „ „ „ „ cob corn	17·6 „
„ „ „ „ kiln-dried corn	10 „
„ amount of corn to cob by weight	75 to 77 „
Estimated loss of weight of corn in store	2 to 3 „
„ „ „ „ „ kiln-drying ...	6·5 to 7 „
„ „ „ „ in grinding corn to meal ...	6·5

FINANCIAL.

Price paid on account for cob corn	3s. 4d. per 100 lb.
„ „ „ „ „ grain	½d. per lb.
Total amount paid on account for corn	£170 9s. 11d.
„ „ realized by sale of meal and corn ...	£523 17s. 2d.
Sale price of meal	15s. 7½d. per 100 lb.
„ value of corn on hand (1,249 lb. Govt reserve) ...	1½d. per lb.
Expenditure on grinding, drying, etc.	£62 1s. 2d.
„ „ labour, materials, etc.	£27 2s. 7d.
Profits on transactions	£264 3s. 6d.
Bonus paid to growers, being approximately ¾ of profits calculated on the price paid on account	120 per cent.*
Total amount per lb., of grain corn	2⅛c. per lb.
Rate charged for grinding	1d. for 7 lb.
„ „ „ kiln-drying	4d. for 56 lb.
„ „ „ shelling	½d. for 56 lb.

The sale of meal in bulk at the granary was started on March 8, when the local price of native corn was 2c. per lb., and American corn meal, for which there was little demand, was being sold at 5c. per lb. The stock of meal was practically all sold with the exception of a small reserve, by June 16. In June the local sale price of native corn prepared at the granary for private parties, was $3·75 per 100 lb., both during and after the granary's operations.

The net spot price for 'wet' grain corn paid was 2⅛c. per lb., which was [illegible] internationally, and weight, bagging and other charges had to be met. It is estimated, therefore, that a bag of corn of 112 lb., if exported, would have to realize $3·33 to equal the granary's payments; but the bulk of the season's exports were sold at prices far below this.

It will be noted that practically all the corn dealt with on a co-operative basis was converted into meal. The meal was for human consumption.

An important fact must be noted, that owing to the high moisture content of some of the corn offered for sale, which was not discovered at the time it was taken over, the co-operative dealings could not have been successfully undertaken on a large scale in the absence of a kiln drier. When some of the corn was bagged for two days only it was found that moulds had developed on it. In consequence of this the corn was not bagged until it could be transferred to the drier.

The value to the people of the colony of the granary, especially in this time of stress and of universal shortage of cereals, cannot be overestimated, and it is confidently expected that the coming year will witness a considerable extension of the granary's activities.

*120 per cent. is slightly larger than the balance sheet shows, but it was deemed good policy to pay it.

From the Experiment Station 620 lb. of selected native yellow corn was distributed to planters, and this helped considerably to raise the standard of the local product. The good results of planting selected seed was clearly seen when dealing with corn at the granary. It should not be difficult to maintain the quality by care in the selection and storage of seed-corn.

COCO-NUTS.

There were further extensions of planting in different districts, but more particularly in the Carib Country. The exports for 1916 show that 505 coco-nuts and 1,389 lb. of copra were shipped. This indicates that the local requirements were met and a surplus remained; and that young groves of plantings made a few years ago were coming into bearing.

In view of the coming into bearing of a large area of coco-nuts, and the difficulty of making copra in a wet climate, it was suggested by the Imperial Commissioner of Agriculture that experiments might be made at the Government Ginnery to ascertain (a) whether the fresh meat of the nut could be used without previous drying for oil extraction purposes, (b) whether copra with a relatively high moisture content could be used in the Anderson oil expeller for oil extraction purposes, and (c) whether the Hess corn drier was suitable for drying 'meat' to copra.

In experiment (a) the fresh meat, after being drained, was shredded and passed to the expeller. The expeller quickly choked, and only a thick emulsion-like liquid, from which oil could not be made to separate, was obtained.

In (b) the expeller gave fairly satisfactory results with copra containing about 14 per cent. of moisture; with regard to (c) no satisfactory results either with shredded or chipped meat were obtained, even after it had remained a long time in the drier at 150° F. The shredded meat tended to pack closely on the shelves as arranged for corn, so that the hot air could not reach the internal portions, and the chipped 'meat' dried too slowly to prove commercially successful.

The experiments, although giving negative results in certain respects, showed that, if necessary, coco-nut oil could be extracted by means of the Anderson oil expeller from copra containing not more than 15 per cent. of moisture. Under certain circumstances it might be better business for growers to ship oil rather than copra, and retain the valuable meal in the island for manurial purposes, and as food for stock.

GROUND NUTS.

The ground nut industry has assumed quite large proportions. Larger areas than usual were planted, and satisfactory prices were obtained in the intercolonial markets. A good deal of damage was done to young ground nuts by the heavy rains in November; but for this the exports would have been larger than those given below.

Year.	Exports.
1914	5,781 bushels
1915	10,386 „
1916	14,641 „

The value of the 1916 exports was placed at £3,660.

PEAS.

Considerable attention was devoted to this important minor industry. The exports of pigeon and black-eye peas, the chief ones grown, doubled those of 1915, as will be seen below.

Year.	Exports. bushels.	Value, £.
1914	2,141	707
1915	3,066	1,017
1916	6,418	2,070

For local consumption, Lima beans, rounceval, and Portuguese or six-weeks peas are widely grown.

The work with beans and peas which was carried on at the Experiment Station, with the object to raise good marketable varieties which would yield well under local conditions, is reported on under that head.

AGRICULTURAL INSTRUCTION, EDUCATION, AND CO-OPERATION.

Agricultural Instruction.

The Agricultural Superintendent and Assistant Agricultural Superintendent paid periodical visits to estates and small holdings in St. Vincent and the Grenadines, in order to inspect and advise on crops, pests, and diseases.

The special travelling work made necessary by the campaign against certain food plants of the cotton stainer, and the directing of general attention to the cultivation of native food crops was considerable.

Reading Courses in Practical Agriculture.

Three candidates sat for the Examination in Practical Agriculture held under the auspices of the Imperial Department of Agriculture. These were Floris Simmons, C. D. V. Hadley, and Rupert Lockhart. Simmons sat for the Final Examination and obtained a second class certificate. Hadley and Lockhart took the Preliminary paper. The former obtained a first, and the latter a third class certificate.

Agricultural Pupils.

Owing to the difficulty of obtaining suitable boys it has been decided to discontinue the agricultural pupil system, and to substitute for the six pupils two cadets with secondary school training. In the selection of cadets preference will be given to candidates who have passed the Cambridge Senior Local Examination.

The cadets will undergo a two-year's course of training in theoretical and practical agriculture, and will ordinarily take the Intermediate Examination of the Imperial Department of Agriculture at the expiration of that period.

Grammar School Classes.

The Assistant Agricultural Superintendent held classes at the Grammar School in Botany for Forms I, II, III, and IV. Several candidates entered for the Cambridge Local Examinations in this subject.

Agricultural Co-operation.

The total number of Agricultural Co-operative Credit Societies formed under the local Ordinance was fifteen at the end of the year, with a total membership of 578. The societies are well distributed through the colony, and the interest in the movement continues to spread.

The profit-sharing scheme with regard to cotton and corn in operation at the Government Ginnery and Granary continue to prove attractive to the small grower, as will be seen in the figures supplied by the manager given in previous pages.

It may be confidently expected that in the future considerable activity will be developed in the direction of the co-operative sale and marketing of produce and stock on the part of the co-operative credit societies themselves, as well as the purchase of agricultural supplies needed by members.

Details of Staff and Administration.

EXPENDITURE, RECEIPTS, SALES OF PLANTS, ETC.

The sum of £1,478 from local funds was voted for the upkeep of the Department, and £1,393 15*s.* 1*d.* was spent—a saving of £84 4*s.* 11*d.* For the destruction of native food-plants of the cotton stainer £300 was voted, and £294 18*s.* 7*d.* was spent.

The following are the details of expenditure :—

	£	s.	d.
Salary, horse and travelling allowance, Agricultural Superintendent	300	0	0
„ „ „ „ „ Assistant Superintendent ...	210	11	10
Salaries, Foremen Botanic and Experiment Stations, and Clerical Assistant	120	0	0
Upkeep of Botanic and Experiment Stations	346	5	3
Salaries and travelling allowances, Government Veterinary Surgeon and Government Vaccinating Officer	285	0	0
Other Charges, Government Veterinary Department	87	7	2
Agricultural pupils' allowances	44	10	10
Total	£1,393	15	1
Destruction of food-plants of the cotton stainer	£294	18	7

From the unexpended balance of £8 3*s.* 4*d.*, on March 31, 1916, of the Imperial grant-in-aid of the Agricultural Department, the sum of £5 5*s* 6*d.* was spent on apparatus and chemicals for the laboratory of the Experiment Station.

The receipts for sale of plants and produce at the Botanic and Experiment Stations amounted to £36 4*s.* 3*d.*

STAFF CHANGES, ETC.

The Agricultural Superintendent was appointed Supervisor of the Government Cotton Ginnery as from April 1, 1916.

The Agricultural Superintendent was granted special leave to represent the Agricultural and Commercial Society at the Triennial Conference of the Associated Chambers of Commerce for the West Indies, held at Trinidad from February 23 to March 2. He left the colony on February 23, and returned to his duties on March 5. During his absence the Assistant Agricultural Superintendent acted as Agricultural Superintendent.

Mr. J. C. Wilson, Cotton Inspector and Government Vaccinating Officer, and Mr. Emanuel Banfield, Foreman of the Botanic Gardens, were appointed Inspectors under the Cotton Stainer Ordinance to assist in the eradication of native food-plants of the cotton stainer.

Mr. Arthur Nanton was appointed Clerical Assistant to the Agricultural Superintendent from April 1.

ADDITIONS AND REPAIRS TO BUILDINGS.

The fence on both sides of the gate at the entrance of the Botanic Gardens was repaired, also the shelter house and potting shed. Minor repairs only were effected at the Experiment Station.

CORRESPONDENCE AND DISTRIBUTION OF INFORMATION ON AGRICULTURAL MATTERS.

During the year under review the local and foreign letters despatched were 473. The number of minute papers dealt with was 292. Several called for special and lengthy reports on different subjects.

Fifty-eight copies of each of the following numbers of the *West Indian Bulletin*, issued by the Imperial Department of Agriculture, were sent free of cost to planters and others interested in the colony: Vol. XV, Nos. 3 and 4; Vol. XVI, No. 1.

The Annual Report of the Agricultural Department, St. Vincent, for 1915-16, was also widely distributed. Copies of a report of the Entomologist and Mycologist of the Imperial Department of Agriculture, on a visit to St. Vincent, were distributed.

A large number of copies of a revised leaflet by the Agricultural Superintendent, entitled 'How to Grow Indian Corn (Maize) in St. Vincent' were sent out to local growers.

ADDITIONS TO THE LIBRARY.

Publications regularly received, besides those from the Imperial Department of Agriculture, were as follows:—

Bulletin of the Imperial Institute: *Review of Applied Entomology* (Agricultural and Veterinary Series): *Gardener's Chronicle*; *Kew Bulletin*; *Bulletin of Entomological Research*; *Experiment Station Record*: *Journal of Agricultural Research*, United States Department of Agriculture; *Journal of the Jamaica Agricultural Society*: *Agricultural Review of the Philippine Department of Agriculture*: *Tropical Agriculturist*: *Tropical Life*: *Bulletin of the Department of Agriculture*, Trinidad and Tobago; *Journal of the Board of Agriculture*, British Guiana: *Circulars and Bulletin of the Department of Agriculture*, Ceylon; *Gleanings in Bee Culture*, A. I. Root Co., Medina, Ohio; Reports of the Porto Rico Agricultural Experiment Station.

Books specially ordered and added to the library were: *The Mechanism of Mendelian Heredity*, Morgan et al: *Variation, Heredity and Evolution*, Lock; *Experimental Zoology*, T. H. Morgan: *Modes of Research in Genetics*, Pearl; *Plant Breeding*, Bailey and Gilbert; *Bulletins on Cotton*, United States Department of Agriculture, Nos. 109, 118, 198, 221, 222, 249: *Science Progress*, Murray. *Nature*, and *Journal of Heredity*, were kindly lent to the Department by the Imperial Commissioner of Agriculture.

PUBLICATIONS.

The following papers, notes and memoranda, were prepared by the Officers of the Department for publication by the Imperial Department of Agriculture and by the local Government:—

'How to Grow Indian Corn in St. Vincent' (revised leaflet), by Agricultural Superintendent.

'Reports on the Work Performed in Connexion with the Destruction of the Food-plants of the Cotton Stainer', by Agricultural Superintendent.

'Notes on Native Food-plants of the Cotton Stainer', by Agricultural Superintendent.

'Report on a visit to the Southern Grenadines' by Agricultural Superintendent.

'Report on a visit to Balliceaux and Battowia', by Agricultural Superintendent.

'A Note on the Trapping of the Cotton Stainer', by Agricultural Superintendent.

'The Shedding of Flower-buds in Cotton', by Assistant Agricultural Superintendent.

'On the Inheritance of the Number of Teeth in the Bracts of Gossypium,' by Assistant Agricultural Superintendent.

'On the Genetics of Crinkled Dwarf Rogues in Sea Island Cotton', Part 1, by Assistant Agricultural Superintendent.

'Notes on Resistance to Cotton Leaf-blister Mite, with special reference to Budded Cotton and to Cotton Hybrids,' by Assistant Agricultural Superintendent.

'Manurial Experiments with Sea Island Cotton with some Notes on Factors affecting the Yield,' by Assistant Agricultural Superintendent.

'Manurial Experiments with Sea Island Cotton,' by Assistant Agricultural Superintendent.

METEOROLOGICAL OBSERVATIONS.

The year 1916 was abnormally wet. The rainfall—137·63 inches—was the heaviest ever recorded at the Botanic Gardens. It was 29·89 inches above the mean of the past twenty-three years—1894-1916. At the Experiment Station the total precipitation amounted to 119·75 inches, which exceeded the mean of the sixteen years during which records have been taken there by 25·33 inches.

A phenomenal rainfall was experienced in all parts of the island during a period of twenty-three days, October 21 to November 12, both dates inclusive, and much damage was done to lands, crops, and roads. The prolonged and heavy rains were probably unequalled in the history of the colony. The total rainfall measured at the Botanic Gardens was 36·17 inches. Of this, 10·57 inches were recorded in the last eleven days of October, and 25·60 inches for the first twelve days of November.

The daily rainfall of this period was as follows :—

October 21	—	1·98 inches	November	1st	—	2·54 inches
„ 22	—	·02 „	„	2nd	—	1·83 „
„ 23	—	1·58 „	„	3rd	—	7·59 „
„ 24	—	1·25 „	„	4th	—	·50 „
„ 25	—	1·71 „	„	5th	—	·13 „
„ 26	—	·13 „	„	6th	—	·80 „
„ 27	—	·05 „	„	7th	—	·65 „
„ 28	—	2·43 „	„	8th	—	·96 „
„ 29	—	·20 „	„	9th	—	3·19 „
„ 30	—	·78 „	„	10th	—	4·88 „
„ 31	—	·44 „	„	11th	—	1·38 „
				12th	—	1·15 „
		10·57 inches.				25·60 inches.

The rainfall of November alone was no less than 32·52 inches.

RAINFALL FOR THE YEAR 1916.

Month.	Botanic Gardens.	Experiment Station.
January	7·44	5·98
February	6·89	5·67
March	9·24	6·79
April	5·76	3·90
May	9·93	6·54
June	12·24	10·64
July	12·37	8·69
August	14·67	13·80
September	8·31	8·31
October	15·97	17·54
November	32·52	29·82
December	2·29	2·07
Total	137·63	119·75

A Diagram annexed shows the annual and mean annual rainfall for twenty-three years—1894-1916—at the Botanic Gardens.

Diagram B shows the mean monthly rainfall at the Botanic Gardens for the past eighteen years, compared with the monthly rainfall for 1916.

The following table gives the mean monthly rainfall for eighteen years at the Botanic Gardens, and for sixteen years at the Experiment Station :—

MEAN MONTHLY RAINFALL, 1899-1916.

Month.	Mean, Botanic Gardens for 18 years, 1899-1916.	Mean, Experiment Station for 16 years, 1901-16.
January	6·43	5·33
February	4·28	3·44
March	4·64	3·93
April	4·52	3·77
May	7·37	6·47
June	12·21	10·94
July	11·41	10·02
August	12·02	10·62
September	11·39	10·21
October	12·33	11·35
November	11·33	10·27
December	8·55	8·06
Total	106·48	94·41

Attention is specially directed to the above table, in order to bring out the fact that reasonably dry weather cannot be expected until December. In order to minimize the losses of cotton due to external fungus and bacterial diseases, flower-bud and boll-shedding, planters may find it necessary to defer the sowing of seed until August and September, but it would be unwise of them to change their present practice of planting in May, June and July, unless the cotton stainer, and the internal boll diseases with which it is associated, can be controlled.

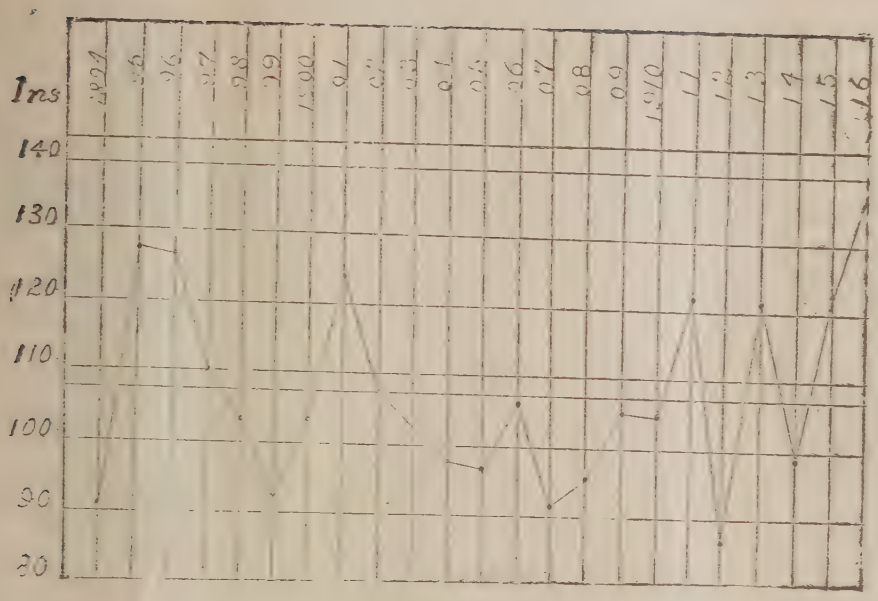

DIAGRAM A.
Showing rainfall at Botanic Gardens from 1894-1916.

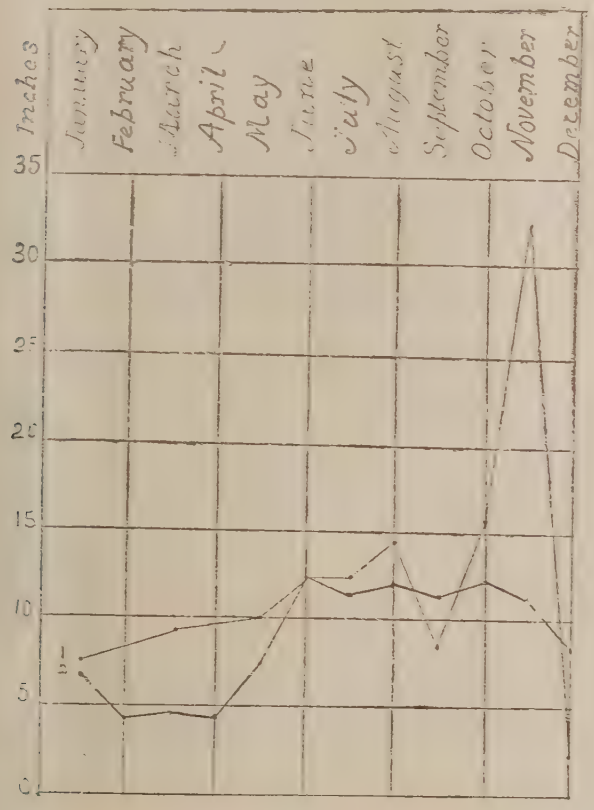

DIAGRAM B.
Showing (1) the monthly rainfall at Botanic Gardens for 1916. (2) the mean monthly rainfall at Botanic Gardens for eighteen years.

METEOROLOGICAL OBSERVATIONS, EXPERIMENT STATION, FOR 1916-17.

Month.	Rainfall, inches.	Mean temperature, degrees F.	Average degree of humidity. Saturation = 100%.	Mean pressure in inches.
April ...	3·90	80·2	66·8	30·004
May ...	6·54	80·4	67·8	30·001
June ...	10 64	80·2	70·7	29·976
July ...	8·69	80·5	71·6	29·996
August ...	13·80	80·5	74·6	29·977
September ...	8·31	80·8	73·2	29·968
October ...	17·54	80·2	73·5	29·931
November ...	29·82	78·5	73·2	29·963
December ...	2·07	78·2	64·5	29·994
January ...	7·57	76·6	66·5	30·011
February ...	3·85	75·6	64·7	30·040
March ...	2·52	76·8	65 5	20·049
Total ...	115·25	79·0	99·4	

Rain fell on 284 days, and the greatest fall for one day was 6·88 inches, on November 3.

Complete rainfall returns for 1916 were received from eleven stations, and are given below :—

Station.	Rainfall in inches.
1. Bellewood	150 23
2. Botanic Gardens	137·63
3. Peniston	136·85
4. Three Rivers	135·94
5 Mesopotamia	133·36
6. Agricultural Experiment Station... ...	119·75
7. Ratho Mill	103·87
8. Petit Bordel	93·06
9. Georgetown	76·87
10. Bequia	75·61
11. Union Island	46·31

ATMOSPHERIC PRESSURE.

The reading of the barometer corrected for instrumental error, elevation, and temperature, ranged from 30·153 inches on February 6, to 29·814 on October 7.

OFFICIAL VISITORS.

Sir Francis Watts, K.C.M.G., Imperial Commissioner of Agriculture for the West Indies, paid brief visits to the island on December 1 and 12. On each occasion opportunity was taken of consulting the Commissioner on agricultural matters.

His Excellency the Governor of the Windward Islands paid an official visit to the Experiment Station and Government Cotton Ginnery on May 3, and the Botanic Gardens on May 15.

Mr. W. Nowell, D.I.C., Mycologist on the staff of the Imperial Department of Agriculture, spent thirteen days in the colony, from November 16 to 28, in connexion with special cotton investigations. He visited the Botanic Gardens, Experiment Station, and Government Ginnery during his stay.

The Hon. G. S. Hudson, of St. Lucia, visited the Experiment Station and Government Cotton Ginnery on March 19.

Mr. Edgar Tripp, Secretary of the Agricultural Society of Trinidad, inspected on December 1 the Experiment Station, Government Ginnery, and Granary.

Plant Legislation.

The legislation in force regarding plant protection in St. Vincent consists of :—

(1) An Ordinance No. 9, 1906 entitled, 'The Importation of Plant Diseases Prevention Ordinance, 1906 '.

Under Section 4 of this Ordinance the Governor-in-Council may by notice absolutely prohibit the importation, directly or indirectly, from any country or place, of any plants, packages, or other articles or things likely to be the means of introducing plant disease into the colony.

The following is a Schedule of the prohibitions in force :—

'From all countries of Central and South America, and the islands of Cuba, Jamaica, and Trinidad—Of all coco-nuts in husk and all growing plants or parts of plants of coco-nut, or any earth or packing material associated with them, or any pruning knives which have been used in the cultivation thereof.'

'From Ceylon, Natal, South India, Mauritius, and the Strait Settlements —Of all plants, seeds, berries, and any earth, soil, or vegetable matter used for packing or covering the same.'

'From South America—Of all cacao plants or trees and parts or portions of such plants or trees, and any earth, soil, or vegetable matter used for packing or covering the same.'

'From the Colony of Trinidad and Tobago—Of any suckers, roots, fruit, or any other portions of a banana plant, and any earth, soil, or vegetable matter used for packing or covering the same.'

Section 5 provides for the fumigation and disinfection by the Agricultural Authority of all plants, packages, etc., imported.

(2) An Ordinance No. 3, 1911 entitled, 'The Cotton Diseases Prevention Ordinance, 1911 '.

Under Section 3 of this Ordinance it is made compulsory before the end of every cotton season for every occupier of land in such parts of the colony to which the Ordinance applies, namely, St. Vincent and the Northern Grenadines, to effectually destroy by fire all cotton plants planted or growing upon land in his occupation during that cotton season. In St. Vincent all cotton plants have to be destroyed by April 30 in each year, and in the Grenadines by March 31

(3) An Ordinance No. 16, 1916, entitled 'The Cotton Stainer Ordinance 1016"

Section 4 of this Ordinance states that the Agricultural Superintendent, the Assistant Agricultural Superintendent, or any Inspector, may, without notice, and with or without assistance, at all reasonable times, enter upon any lands, for the purpose of ascertaining whether the cotton stainer is present on any tree, shrub, or herb, or on any soil or manure, or for the purpose of searching for any tree, shrub, or herb upon which the cotton stainer is accustomed to feed, and may take all such measures on such land as may be deemed necessary for the eradication of, or for the prevention of the spread of, the cotton stainer in the colony, including in such measures the total destruction, if necessary, of any trees, shrubs, or herbs upon which the cotton stainer is accustomed to feed.

Section 5 provides that any expenses incurred under Section 4 shall be paid from the General Revenue of the colony, and Section 6 makes it lawful for the Governor-in-Council to make grants by way of compensation to occupiers and to owners in cases where substantial damage has been occasioned by the destruction of food-plants.

Report of the Government Veterinary Surgeon, St. Vincent.

For the Year ended March 31, 1917.

The total sum expended was £372 7*s.* 2*d.*, as against £403 12*s.* 9*d.* in 1915-16, and £513 13*s.* 10*d.* in 1914-15. This progressive decrease in the expenditure for working the Veterinary Department is due to the measures adopted year by year to deal with the control and attempted eradication of anthrax in the colony. As will be seen by reference to the paragraph dealing with anthrax, very few cases of this disease have been met with during the last five years.

The amounts expended were as follows:—

	£	s.	d.
Disposal and supervision of carcasses	19	19	2
Anthrax vaccine and appliances	34	11	7
Salary and travelling allowance for Government Veterinary Surgeon	250	0	0
Salary and travelling allowance for Government Vaccinating Officer	35	0	0
Salary Clerical Assistant	18	0	0
Salary Office Messenger	6	19	9
Telephone	6	0	0
Special Services		18	0
Contingencies		18	0
Total	372	7	2

ANTHRAX.

No case of anthrax occurred during the year. With the exception of five cases which occurred in animals fed on a field at the back of Kingstown, during the period July 9, to October 3, 1914, no death from this disease has taken place since July 25, 1911. Shortly after October 1914 the field referred to—a swampy, low-lying one—was drained, and this no doubt accounts for the fact that cattle are now continuously grazed thereon without any apparent ill effects.

VACCINATION.

Artificial immunization has been now undertaken primarily for the purpose of preparing animals for export to those colonies requiring such preventive treatment: 1,124 animals were so dealt with during the period under review.

EXPORTS.

Three hundred and ninety-seven animals, valued at £2,019, were exported under certificate. See table appended marked B. To these must be added animals exported to colonies not requiring veterinary certificates.

Table C shows the total exports of stock, all of which went to neighbouring West Indian colonies, including Martinique.

IMPORTS.

Forty-seven animals, as under, were brought to the colony during the year:—

No.	Animal.	From.	Remarks.
1	cow	Barbados	Holstein-Friesian.
2	mules	„	Montevidean.
6	goats	„	½-bred Toggenburgs.
31	pigs	„	23 of these were crossed O.I.C. Berkshire.
1	donkey	„	Kentucky 14·2 jenny.
1	„	Trinidad	„ 13-hand jack.
5	cattle	St. Lucia	

TABLE A. SHOWING DEATHS IN DISTRICTS FROM NATURAL CAUSES.

District.	Cattle.	Horses.	Mules.	Asses.	Sheep.	Goats.	Pigs.	Total.
Barrouallie ...	13	3	0	6	2	22	3	49
Calliaqua	24	5	1	5	4	6	7	52
Chateaubelair ...	12	2	0	3	1	3	11	32
Colonarie	14	6	0	8	4	1	9	42
Georgetown ...	18	1	3	13	3	13	9	60
Kingstown ...	96	7	1	15	19	55	59	252
Layou	11	4	0	11	4	4	7	41
Mesopotamia ...	54	5	0	25	12	35	52	183
Total	242	33	5	86	49	139	157	711

TABLE B. SHOWING NUMBER, KIND, AND VALUE OF STOCK EXPORTED FOR WHICH VETERINARY CERTIFICATES WERE GRANTED. ALSO THE COLONIES TO WHICH THE ANIMALS WERE EXPORTED.

Class of animal.	Barbados.		Trinidad.		Grenada.		St. Lucia.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
		£		£		£		£		£
Cattle ...	23	115	11	55	5	25	128	715	167	910
Horses ...	27	405	...	...	1	15	4	80	32	500
Asses ...	154	462	16	48	1	3	...	...	171	513
Sheep ...	8	6	...	...	...	...	11	8	19	14
Goats ..	4	2	...	...	...	..	...	...	4	2
Mules ...	...	...	...	...	4	80	...	...	4	80
Total ...	216	990	27	103	11	123	143	803	397	2,019

TABLE C. SHOWING THE EXPORT OF STOCK, AND THEIR VALUE, FOR THE YEAR 1916.

Kind.	Number.	Value.		
		£	s.	d.
Cattle	821	4,406	0	0
Horses	40	705	6	4
Asses	249	824	8	4
Mules	4	67	10	0
Sheep	805	454	1	6
Goats	1,371	343	7	0
Pigs	1,531	1,531	0	0
Total	4,821	8,331	13	2

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